

Attorney Docket No. 98-13  
PATENT

90. (new) The apparatus of claims 70, 71, 73, 74, 75 or 79 wherein the plurality of reaction vessels is at least six reaction vessels and the plurality of flow restrictors or regulators is at least six flow restrictors or regulators.

91. (new) The apparatus of claims 70, 71, 73, 74, 75 or 79 wherein the plurality of reaction vessels is at least forty-eight vessels and the plurality of flow restrictors or regulators is at least forty-eight flow restrictors or regulators.

92. The apparatus of claims 70, 71, 73, 74, 75 or 79 further comprising a catalyst in each of the plurality of reaction vessels.

#### REMARKS

Applicants respectfully request reconsideration and further examination of the present application.

#### Amendments to the Specification

The specification has been amended to conform the specification to the application as-filed. Specifically, the summary and written description of the specification have been amended to incorporate subject matter originally disclosed in as-filed claims 55 through 59, subsequently restricted pursuant to the Office action dated September 20, 1999 and the response thereto.

No new matter is added by the amendments.

#### Amendments to the Claims

Claims 1, 3, 4, 6, 11, 17, 19, 26, 32, 34, 35, 37 and 44 have been amended to more particularly point out and distinctly claim the subject matter that Applicants regard as the invention.

Specifically, as amended, each of independent claims 1 and 32 have been amended to clarify that the fluid handling system provides fluid flow *simultaneously* through a plurality of vessels (e.g., reaction vessels). Claims 1 and 32 have been amended, as well, to clarify that each of the plurality of flow channels has at least one

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flow restrictor, and that – for any given flow channel – the (one or more) flow restrictor(s) can be located either upstream of the vessel (between the entrance control volume and vessel) and/or downstream of the vessel (between the vessel and the exit control volume).

Each of claims 1, 6, 11, 17, 26, 32, 37 and 44 have been amended to clarify that references to “each of” a particular feature (*e.g.*, “each of the vessels”) refers to “each of the *plurality of*” a particular feature (*e.g.*, “each of the *plurality of* vessels”).

Claim 1 has been further amended to clarify that the embodiment of the screening apparatus defined by claim 1 includes at least six vessels with associated parallel flow channels through each of such at least six vessels. Claims dependent from claim 1 have been amended to be consistent with this amendment.

Claim 3 has been amended to depend from claim 1, or alternatively, from claim 2. Similarly, claim 19 has been amended to depend from claim 17, or alternatively, from claim 18. Likewise, claim 34 has been amended to depend from claim 32, or alternatively, from claim 33.

Claims 4 and 35 have been amended to clarify the nature of the sampling probe, and the configuration of the sampling probe relative to other apparatus components.

Claim 32 has been further amended to clarify that the vessels of the reactor are reaction vessels. Claims dependent from claim 32 have been amended to be consistent with this amendment.

Each of the amended claims are fully supported by the original claims alone or in conjunction with the specification. No new matter has been added.

As noted, all of the claim amendments were intended to clarify, without substantively changing, the scope of the subject matter defined by the claims. As such, Applicants in no way intend to surrender any range of equivalents beyond that which is necessary to patentably distinguish the claimed combination as a whole over the prior art. Applicants expressly reserve patent coverage to all such equivalents that may fall in the range between Applicants’ literal claim recitations and those combinations taught in the prior art.

New Claims

New claims 63-92 have been added to more particularly point out and distinctly and specifically claim certain preferred embodiments of the invention.

Briefly, new claim 69, like pending claim 32, is directed to a reactor for screening catalysts, that comprises a plurality of reaction vessels and a fluid handling system for providing fluid flow simultaneously through the plurality of reaction vessels. The fluid handling system is characterized by, among other features, one or more flow restrictors or flow regulators in each of the plurality of flow channels. The flow restrictors or regulators can be located either upstream of the vessel (between the entrance control volume and vessel) or downstream of the vessel (between the vessel and the exit control volume), and in either case, are adapted to provide substantially the same flow simultaneously through each of the plurality of reaction vessels. New claim 70 depends from claim 69, and further requires a detector for analyzing vessel effluent.

Each of new claims 63, 66 and 73 require, among other features, a selection valve that can provide for selective fluid communication between a selected vessel (e.g., reaction vessel) and one or more detectors (e.g., a gas chromatograph). New claim 74 requires, among other features, such a selection valve in combination and cooperation with a sampling valve and associated sample bypass line.

Each of new claims 64, 67, 75 and 76 require, among other features, a distribution valve that can provide for selective fluid communication between the entrance control volume and a selected vessel (e.g. reaction vessel).

Each of new claims 65, 68 and 77 require, among other features, both a distribution valve and a selection valve. New claim 78 requires, among other features, a distribution valve, a selection valve, and a control system for synchronized operation of the distribution and selection valves, such that comparative test data is obtained for each of the plurality of flow channels.

New claim 71 requires, among other features, a sampling probe selectively positioned to sample vessel effluent and adapted to transport the sampled effluent to the detector. New claim 72, requires, among other features, such a sampling probe in combination and cooperation with a sampling valve and associated sample bypass line.



New claim 79 requires, among other features, a modular assembly for containing the plurality of vessels – including a base block and cover block. New claims 80 and 81, dependent from new claim 79, are directed to preferred embodiments of the assembly.

New claims 82 through 92 are dependent claims that further characterize preferred embodiments of the invention.

No new matter has been added by any of the new claims.

#### Acknowledgement of Withdrawal of Election of Species Requirement

Applicants acknowledge the withdrawal of the election of species requirement set forth in the Office action dated September 20, 1999.

#### Acknowledgement of Allowable Subject Matter

Applicants hereby acknowledge that claims 17 to 31 are allowed.

#### Interview

Applicants thank the Examiner for the courtesy of an interview on February 3, 2000, during which the claims and prior art of record were discussed. Additional prior art, submitted by an Information Disclosure Statement filed on the day of the interview, February 3, 2000, was also discussed.

#### Rejections Under 35 U.S.C. Section 112, 2<sup>nd</sup> Paragraph

Claims 1-16, 32-48 and 61-62 have been rejected under 35 U.S.C. 112, 2<sup>nd</sup> paragraph, as being indefinite. In particular, the Office action states that claims 1 and 32 are indefinite as to: “a plurality of [sic: flow restrictors providing fluid communication between each of the] vessels [sic: and] ‘one of the entrance control volume and the exit control volume’ ”. (See Office action at page 2).

Claims 1 and 32 have, as noted above, been amended to clarify that each of the plurality of flow channels has at least one flow restrictor, and that – for any given flow channel – the (one or more) flow restrictor(s) can be located either upstream of the vessel (between the entrance control volume and vessel) and/or downstream of the vessel (between the vessel and the exit control volume). As such, the rejection under Section

112 is obviated with respect to claims 1 and 32, and with respect to each of claims 2-16, 33-48 and 61-62 dependent therefrom.

Applicants acknowledge that claims 4-7, 15, 16, 35-40, 47, 48, 61 and 62 were considered in the Office action to be allowable if rewritten to overcome the rejections under Section 112 (and to include the requirements of the base claim and any intervening claims). (See Office action at page 4). In view of the amendments discussed above, each of these claims are now in condition for allowance.

Rejection under 35 U.S.C. Section 103(a)

Claims 1-3, 8-9, 11-14, 32-34, 41-42 and 44-46 have been rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 4,099,923 to Milberger in view of U.S. Patent No. 5,753,185 to Mathews et al. According to the Office action, Milberger is said to teach an apparatus having a plurality of vessels with inlets and outlets, a detector for analyzing vessel effluent and a fluid distribution system comprising an entrance control volume and exit control volume. The Office action notes, however, that Milberger does not teach a plurality of flow restrictors. Mathews et al. is said to teach the use of a plurality of flow restrictors. (See page 3 of the Office action).

Claims 10 and 43 have been rejected under 35 U.S.C 103(a) as being obvious over Milberger in view of Mathews et al. and further in view of "Basics of Thermal Mass Flow Control (Unit Instruments)." The Office action notes that Milberger and Mathews et al. do not teach temperature-based flow regulators, but observes that Unit Instruments teaches temperature-based flow control. (See pages 3 and 4 of the Office action).

Applicants respectfully traverse these rejections for the reasons set forth below.

*The Combination of Cited References Does Not Teach or Disclose the Invention*

The Office action does not establish, *prima-facie*, that the presently claimed invention would have been obvious in view of the cited references. Even if it is assumed, *arguendo*, that the references were properly combined, the references do not disclose or teach the invention as claimed.

The inventions defined by independent claims 1 and 32 are directed to reactors and apparatus having a fluid handling system that provides fluid flow simultaneously

through each of a plurality of vessels, and apportioned about equally between each of the plurality of vessels. To this end, each of the plurality of vessels are in fluid communication, simultaneously, with both the entrance control volume and exit control volume. Each of the plurality of flow channels also has one or more flow restrictor(s) adapted such that fluid flow through the vessels is apportioned about equally through each of the plurality of vessels. Specifically, the flow restrictors are characterized in that (i) for a given flow channel, the resistance to flow is greatest in the flow restrictor, and that (ii) as compared between the plurality of flow channels, the resistance to flow in the flow restrictor(s) is about the same.

Hence, the cited references, Milberger and Mathews et al. do not disclose or teach the invention defined by claims 1 and 32 – whether considered alone, in combination with each other, or in combination with other art of record. Although these references disparately disclose several components of the apparatus of the present invention (*e.g.*, vessels, flow restrictors), the references do not, even in combination, teach or disclose the particularly required configuration of such components, and do not teach or disclose the particular adaptation of these components in the manner required by the as-claimed invention. Moreover, none of the other references of record make up for the deficiencies of the cited art.

As such, Applicants assert that each of independent claims 1 and 32, together with claims dependent therefrom (*i.e.*, claims 2, 3, 8-14, 32-34, and 41-46), are now in condition for allowance. Notice of the same is respectfully requested.

#### New Claims are Also in Condition For Allowance

Applicants submit that each of the new claims are also in condition for allowance, for the reasons set forth herein.

Applicants note, that new claims 63-68 and 71-81 require certain distinguishing features that are also required in considered claims 4-7, 15, 16, 35-40, 47, 48, 61 and 62 – each of which, as noted above, did not have any art-based rejections and is now in condition for allowance (assuming obviation of the Section 112, 2<sup>nd</sup> paragraph rejection thereof). The distinguishing features of these new claims are detailed above.

Although such new claims are, admittedly, broader in certain aspects than the considered claims (e.g., with respect to the particulars of flow-control through the plurality of vessels), Applicants respectfully assert that each of the aforementioned new claims, as well as claims dependent therefrom (including claims 82-92), should likewise be in condition for allowance.

New claims 69 and 70 should also be in condition for allowance, in view of the prior art of record and the aforementioned remarks.

#### New Art of Record

Applicants respectfully submit that each of the presently-pending claims define inventions that are patentably distinct from all art currently of record – including the additional prior art submitted by the Information Disclosure Statement filed February 3, 2000. In particular, the present invention is patentable over U.S. Patent No. 4,705,669 to Tsuji *et al.*, discussed during the aforementioned interview, considered alone and/or in combination with other art of record.

Applicants inventions, considered as a whole, are novel and non-obvious over Tsuji *et al.* and the other art of record. Tsuji *et al.* teach a detection scheme in which a sample stream is split, and the resulting split sample streams are differentially diluted with dilution factors being varied to allow for detection of varying expected concentrations of analyte. Tsuji *et al.* does not, however, teach or disclose a high-throughput apparatus comprising at least six vessels with corresponding, parallel flow channels as required by independent claim 1 and claims dependent therefrom. Likewise, Tsuji *et al.* does not teach or disclose an apparatus comprising a plurality of reaction vessels with corresponding, parallel flow channels, as required by independent claims 32, 69, 71, 73, 74, 75, 79 and claims dependent therefrom. Moreover, Tsuji *et al.* does not disclose other distinguishing features required by some of the presently-pending claims (e.g., distribution valves, selection valves, *etc.*, as summarized above).

The other art of record does not make up for the deficiencies of Tsuji *et al.* For example, even if Tsuji *et al.* is, *arguendo*, considered in combination with Milberger (relied upon in the Office action dated December 20, 1999), the combination of references does not teach the invention as claimed. In particular, the single-channel

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reaction system of Milberger remains a single-channel reaction system even if the effluent stream therefrom is split and then detected in parallel as taught by Tsuji *et al.* Moreover, there is no motivation *in the art* to combine the Tsuji *et al.* and Milberger references in a manner that would lead to Applicants' inventions. Among other considerations, when considered in its entirety, Tsuji *et al.* teach away from the present invention – in that most of the embodiments disclosed therein provide for varying flow through the two detection channels (rather than providing for substantially the same flow as required in the presently-pending claims).

As such, Applicants inventions – considered *as a whole* – are novel and non-obvious in view of all of the art of record.

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In view of the foregoing remarks, Applicants submit that each of the claims are now in condition for allowance, and respectfully request notice of the same.

Applicants respectfully request that the Examiner charge Deposit Account No. 50-0496 in the amount of \$ 1027.00 for the fees required under 37 CFR §1.16(b), §1.16(c), and 1.16(d). The Examiner is also authorized to charge any underpayment or to credit any overpayment of the above referenced fees to this Deposit Account.

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Respectfully submitted,



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